

# The 2<sup>nd</sup> Law of Thermodynamics Limits Thermal Engine Efficiencies.

<u>Process</u>	<u>Conversion Type</u>	<u>Efficiency</u>
Large Electric Generator	Mechanical to Electrical	98-99%
Large Electric Motor	Electrical to Mechanical	90-97%
Home Gas Furnace	Chemical to Thermal	90-96%
Small Electric Motor	Electrical to Mechanical	60-75%
Fuel Cell	Chemical to Electrical	50-60%
Large Steam Turbine	Thermal to Mechanical	40-45%
Diesel Engine	Thermal to Mechanical	30-35%
Gasoline Engine	Thermal to Mechanical	15-25%
Florescent Lights	Electrical to Radiative	15-25%
Incandescent Lights	Electrical to Radiative	2-5%
Plant Photosynthesis	Radiative to Chemical	1%

# Where Does Your \$1 of Gas Go?

4% idling **loss**

3% transmission **loss**

74% heat **loss**



3% acceleration

6% rolling friction

3% accessories

7% air drag

# US Electricity Production, 2008

